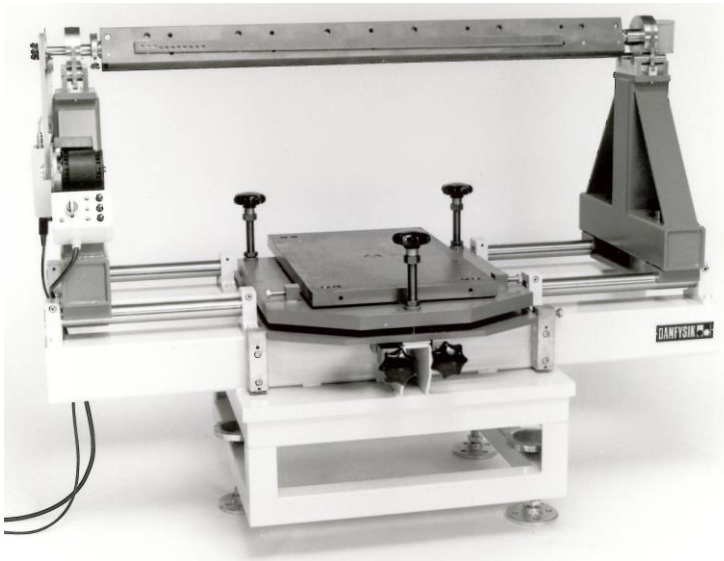


Model 690

Rotating Coil Test System

for analysis of Harmonic Content in Multipole Magnets

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The Rotating Coil Test System, Model 690, is a device for harmonic analysis of the magnetic field in multipole magnets. The system comprises an adjustable support with a constant frequency rotating coil device, which is precisely machined and balanced.

A wide range of coil sizes is available, thereby allowing magnets of various sizes and apertures to be analyzed.

The basic concept used is to rotate a coil with constant angular velocity centrally on the magnet axis. An almost pure sinusoidal voltage is induced in the coil by changing magnetic flux through the coil. The voltage induced in the induction coil is analyzed and processed to measure the magnetic field profile in the bore.

Basic formula for the coil voltage caused by the quadrupole component:

$$K_2 [\text{Volt}_{pp}] \sim N \times \omega \times r_m^2 \times G \times l_{\text{eff}}$$

N : turns in coil

ω : angular frequency of coil = $2 \times \pi \times f$ [s^{-1}]

r_m : rotation radius of outer coil leg [m]

G : gradient of quadrupole field [T/m]

l_{eff} : effective length of quadrupole [m]

Mechanical construction:

- Main base plate adjustable on support frame
- Magnet can be adjusted vertically and horizontally and rotated with respect to coil center line
- Wide range of base plate to magnet center line distances can be handled

Weight: Approx. 600 kg.

Electrical power required: 3x415 V AC 50/60 Hz for motor
1x230 V AC 50/60 Hz for trigger

Rotating Coil Range:

The coils are designed for a maximum mechanical length of the magnet pole shoes of 400 mm.

The coils are longer than the pole shoes in order to cover the fringing fields down to typically 1-0.1% of the central field intensity,

The coils are statically and dynamically balanced.

The rotation frequency is approx. 10.4 Hz (for line frequency of 50 Hz).

Examples of coil previously built for model 690:

Eff. coil diameter, mm	30	41	52	116
Outer coil cylinder dia., mm	36	45	56	120
Eff. coil length, mm	550	530	630	650
Overall coil cylinder length, mm	800	660	760	780
Magnet aperture diameter range, mm	38-44	47-55	58-69	122-155

With the maximum apertures shown the individual coils will cover min. 80% of the aperture.

Readout of Measurements:

The voltage induced in the induction coil is analyzed and processed to measure the magnetic field profile in the bore. The data sampling is done by a National Instruments NI3239 four channel input module with a 24-bit resolution and a sampling rate of 50 kS/s per channel. The measured data is analyzed in a LabView program graphically displaying the raw and FFT signals, and showing the multipole amplitudes of the field in a table form. The data can also be saved to a file for further analysis in 3rd party programs.

Typical GUI (Graphical user interface)

